



SDMS Doc ID 2015044

**The Environmental Law Section
of the Santa Clara County Bar Association Presents a MCLE Luncheon**

Santa Clara County Bar Association
For the Professional Development of Attorneys in Silicon Valley and Beyond

**Perchlorate Contamination in the Morgan Hill/ San Martin
Community**

An update on the regulatory, water supply and toxicological issues related to the litigation now pending in Northern California District Court concerning perchlorate groundwater contamination in the Morgan Hill area.

Lunch will be provided.

Robert A. Howd, Ph.D - Speaker

Chief, Water Toxicology Unit,
Office of Environmental Health Hazard Assessment, Cal/EPA

Thomas K.G. Mohr, R.G., C.E.G., C.H. - Speaker

Associate Engineering Geologist,
Santa Clara Valley Water District

Kevin P. Mayer - Speaker

Regional Perchlorate Coordinator, EPA Region 9

Harvey Packard - Speaker

Senior Groundwater Resources Engineer,
Central Coast Regional Water Quality Control Board

Keith M. Casto - Moderator

Partner
Sedgwick Detert Moran & Arnold

Wednesday, August 13, 2003

**Registration - 10:30 AM
Program - 11:00 AM to 1:00 PM**

**Bingham McCutchen LLP
1900 University Avenue
East Palo Alto, CA**



Keith M. Casto
Partner, San Francisco, CA

- Environmental and Regulatory and Transactional Consultation
- Environmental and Toxic Tort Litigation
- Environmental White Collar Criminal Defense

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Current Scope of Practice

Keith M. Casto is a partner resident in Sedgwick's San Francisco office. His practice focuses on environmental regulatory and transactional consultation, environmental and toxic tort litigation, and white collar environmental criminal defense.

Mr. Casto's environmental toxic tort regulatory and litigation practice encompasses regulatory compliance counseling for all environmental media, real estate transactional consultation, domestic and international environmental audits, environmental management system consultation, civil litigation, including cost recovery for soil and ground water contamination under Superfund and various common law theories and toxic tort defense. In addition, he represents industrial clients, real estate developers and individuals in defense of criminal prosecutions at federal, state and local levels in California and throughout the United States.

Affiliations, Activities and Accomplishments

Mr. Casto's environmental law expertise stems from his ten years of practice at the U.S. Environmental Protection Agency ("EPA") at the Atlanta Regional Office and over 15 years in private practice in Northern California and Atlanta, Georgia.

Mr. Casto has practiced extensively before a number of environmental agencies in California, including the EPA, Region IX; the California EPA; the Bay Area Air Quality

Management District; the Regional Water Quality Control Boards; the U.S. Corps of Engineers; San Francisco Bay Conservation and Development Commission; the State Water Resources Control Board; the California air Resource Board; the California Department of Toxic Substances Control; and numerous fire departments, water districts and county health departments.

Mr. Casto has taught environmental, energy and natural resource law at the law school level and co-authored a textbook on environmental health. Mr. Casto is active in environmental affairs for the following local and national organizations: The Environmental Law Institute, Pacific Industry and Business Association, the San Jose Silicon Valley Chamber of Commerce, the Semiconductor Safety Association, the National Association of Industrial and Office Parks, the Santa Clara County Bar Association, the San Francisco Bar Association, the California State Bar, Northern District of California, and the American Bar Association. He is also a member of the Georgia and Florida State Bars.

Education

Mr. Casto received his undergraduate degree (1969) from Stetson. He earned his J.D. (1973) from Stetson University College of Law.

PERCHLORATE

Kevin Mayer
U.S. EPA, Region 9



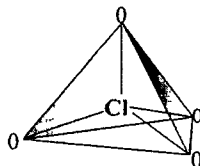
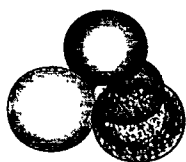
Perchlorate - Chemistry & Uses
History of Environmental Concern
Occurrence
Toxicity
Regulatory Status
Treatment Technologies
Ecology and Agriculture

Perchlorate CHEMISTRY



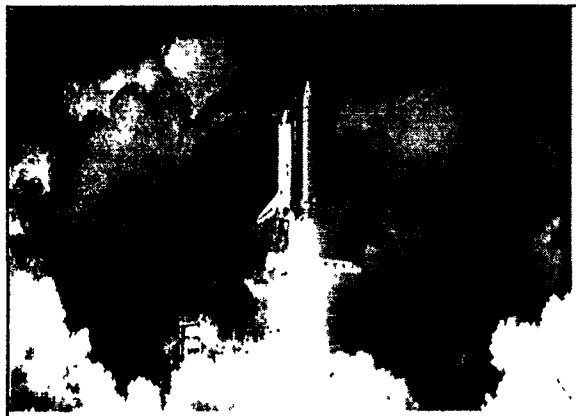
Dissolves and Moves Like Salt in Water
Highly Soluble, Mobile, Stable
Hard to Treat by Usual Methods
Hard to Detect Below 400 ppb,
until March 1997

PERCHLORATE ClO_4^-



Perchlorate USES

90% Manufactured for Solid Rocket Fuel
Explosives
Fireworks, Flares and Smoke Markers
Reported in Nitrate Fertilizer from Chile



Perchlorate HISTORY

1908 - First Manufactured at Niagara Falls,
Eventually at 9 Locations

1980s - Aware of Perchlorate Use at
CA and NV Superfund Sites

1990s - Aerojet in Rancho Cordova
Discovered at > 1000 ppb in Groundwater



Perchlorate HISTORY

1992 and 1995 - EPA Provisional Reference Dose at 4 - 18 ppb

1997 - Analytical Breakthrough to 4 ppb

1998 - Region 9 Requests Manufacturer's Information

1997 and 1998 - Region 9 Alerts EPA HQ, Regions, and States



Perchlorate SHIPMENTS



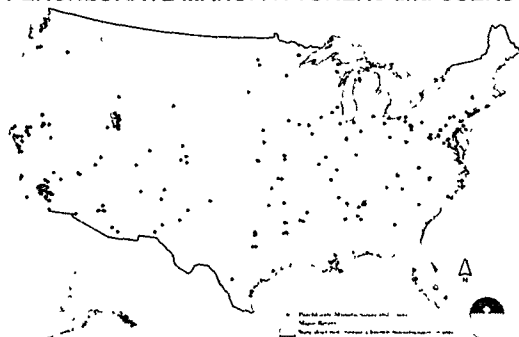
Manufacturer's Information
from Region 9 Requests

About 240 Facilities

40+ States

Information Not Available Before 1970s

PERCHLORATE MANUFACTURERS and USERS



APRIL, 2003

Perchlorate OCCURRENCE



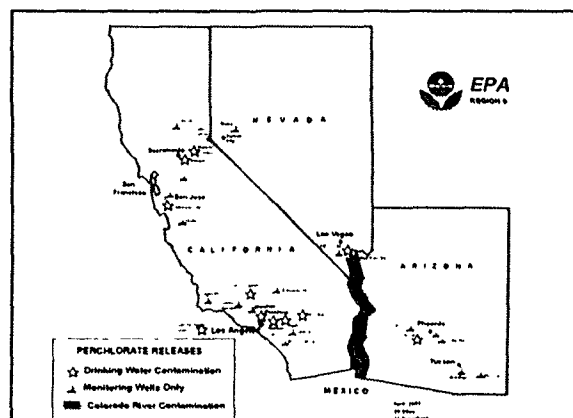
Releases Reported in 29 States

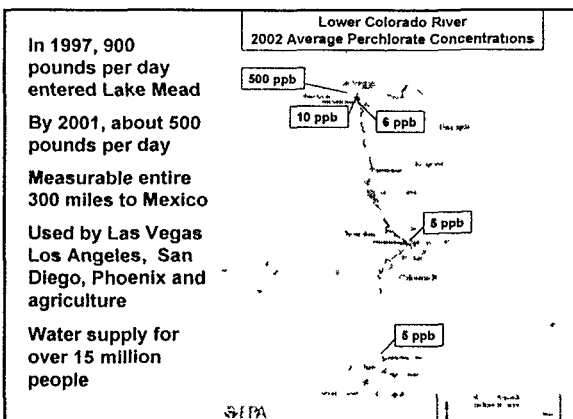
AL, AZ, AR, CO, GA, IA, KS, MD, MO, MA, MN, NE, NV, NJ, NM, NY, NC, OR, PA, TX, UT, VA, WA, WV, also FL, LA, MS, RI since April

CALIFORNIA

Over 5800 Water Supply Wells Tested
Detected in 329 sources, 5.6 %

PERCHLORATE RELEASES - April, 2003





Perchlorate TOXICOLOGY

Used as Human Drug Since 1950's
Blocks Iodide Uptake into Thyroid,
Disrupts Production of Hormones
EPA Provisional Reference Dose 1992-95
4 to 18 ppb in Drinking Water
No Data on Children's Health or
Chronic Effects
1000x Uncertainty Factors

What is a REFERENCE DOSE (RfD)?

Science Based Only, Not a Regulation
DOSE is mg Chemical per kg body wt. / day
$$RfD = \frac{\text{No or Lowest Observed Effect Level}}{\text{Uncertainty Factors}}$$

Perchlorate TOXICOLOGY

Studies from 1997 to 2001 Used to
Measure Impact
EPA Focused on Sensitive Populations
and Chronic Effects
Draft EPA Toxicity Assessment Set RfD at
0.00003 mg/kg-day
Drinking Water Equivalent = 1 ppb for
Adults
Only 300x Uncertainty Factors

EPA 2002 Draft Effects on Lab Animals

0.01 mg/kg-day, lowest dose

Thyroid hormones
Thyroid histopathology
Brain morphometry

Perchlorate TOXICITY

EPA Schedule

January - June 2002 External Peer Review
Expected Final Draft in Spring 2003
2003 National Academy of Sciences Review
2004 (approx.) Revised Reference Dose on
Integrated Risk Information System (IRIS)



Perchlorate REGULATORY STATUS



EPA has Exercised Authority Under
SDWA, RCRA, CERCLA
Cleanup Decisions are Site-specific, No Federal
Standard
Contaminant Candidate List to Consider
Possible Drinking Water Standard (MCL)
EPA's MCL Process Takes Several Years
(2008?)
Possible EPA Health Advisory (Office of Water)

Perchlorate REGULATORY STATUS

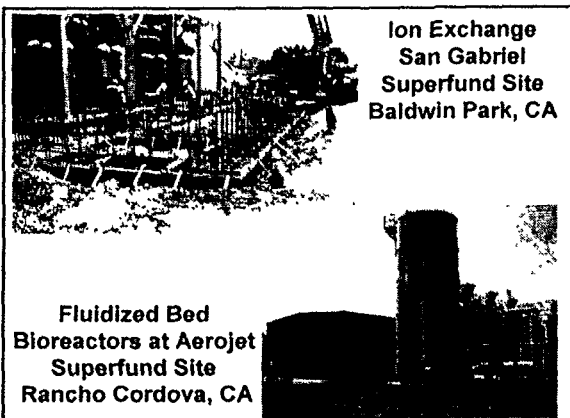


State and Tribal Advisory Levels

California... 4 ppb
New York... 5 ppb and 18 ppb
Texas... 4 ppb, 7 ppb or 10 ppb
Arizona... 14 ppb
Massachusetts... 1 ppb
Maryland... 1 ppb
New Mexico... 1 ppb
Nevada... 18 ppb

Perchlorate TREATMENT TECHNOLOGIES

Treatment Systems are Operating
Full Scale, Commercially Available
Ion Exchange – Regenerate or Dispose
Various Types of Biological Systems
Reverse Osmosis for Small Systems



Perchlorate ECOLOGY & AGRICULTURE



**Direct Effects on Fish/Animals Observed
at High Concentrations**

Unknown Effects at Lower Concentrations

Agriculture Uses Colorado River and GW

- Lettuce near Yuma
- Many Crops in Imperial Valley/Coachella Valley
- Citrus in Riverside

Perchlorate INFORMATION



U.S EPA Technology Innovation Office
www.clu-in.org/perchlorate

American Water Works Assn Research
www.awwarf.com/research/spperch.asp

MARCH 2002

The United States Environmental Protection Agency (EPA) has released its revised draft toxicity assessment, "Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization." When finalized, this assessment will be an important update of EPA's health assessment that reflects the state of the science regarding the health effects of the chemical perchlorate. The preliminary revised human health risk estimates found in the document are still undergoing review and deliberations both by the external scientific community and within EPA, and do not represent EPA policy at this stage.

How To Review and Comment on EPA's Draft Perchlorate Toxicity Assessment

The draft perchlorate toxicity assessment is available at EPA's National Center for Environmental Assessment (NCEA) Web site www.epa.gov/ncea under "what's new." Written public comments on the scientific literature and on EPA's characterization of the science in the draft perchlorate assessment will be accepted by EPA's contractor, Eastern Research Group, for consideration during the Agency's document revision process. These comments will be made available to the peer reviewers. Public comments must be received by April 5, 2002. Send your comments to: Eastern Research Group ERG, Attn: Meetings, 100 Hartwell Avenue, Lexington, MA 02421. If your comments are under 50 pages in length, you can send them via email attachment (in Word, WordPerfect or PDF) to meetings@erg.com.

What is Perchlorate?

Perchlorate is both a naturally occurring and man-made chemical. Most of the perchlorate manufactured in the United States is used as the primary ingredient of solid rocket propellant. Wastes from the manufacture and improper disposal of perchlorate-containing chemicals are increasingly being discovered in soil and water.

How Can Perchlorate Affect Human Health?

Perchlorate interferes with iodide uptake into the thyroid gland. Because iodide is an essential component of thyroid hormones, perchlorate disrupts how the thyroid functions. In adults, the thyroid helps to regulate metabolism. In children, the thyroid plays a major role in proper development in addition to metabolism. Impairment of thyroid function in expectant mothers may impact the fetus and newborn and result in effects including changes in behavior, delayed development and decreased learning capability. Changes in thyroid hormone levels may also result in thyroid gland tumors. EPA's draft analysis of perchlorate toxicity is that perchlorate's disruption of iodide uptake is the key event leading to changes in development or tumor formation.

What are the Preliminary Conclusions of the Draft Toxicity Assessment?

The EPA draft assessment concludes that the potential human health risks of perchlorate exposures include effects on the developing nervous system and thyroid tumors. The draft assessment includes a draft reference dose (RfD) that is intended to be protective for both types of effects. It is based on early events that could potentially result in these effects, and factors to account for sensitive populations, the nature of the effects, and data gaps were used. The draft RfD is 0.00003 milligrams per kilogram per day (mg/kg/day). The RfD is defined as an estimate, with uncertainty spanning perhaps an order of magnitude, of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of adverse effects over a lifetime. As with any EPA draft assessment document containing a quantitative risk value, that risk value is also draft and should not at that stage be construed to represent EPA policy. Thus, the draft RfD for perchlorate is still undergoing science review and deliberations both by the external scientific community and within the Agency.

The assessment provides a hypothetical conversion of the draft RfD to a drinking water equivalent level, assuming factors of 70 kilograms (kg) body weight and 2 liters (L) of water consumption per day. The converted draft estimate would be 1 microgram per liter (ug/L) or 1 part per billion (ppb). If the Agency were to make a determination to regulate perchlorate, the RfD, along with other considerations would factor into the final value.

Does Perchlorate Cause Cancer?

Perchlorate is associated with disruption of thyroid function which can potentially lead to thyroid tumor formation. This draft toxicity assessment accounts for both developmental and tumor formation effects.

Does My Water Contain Perchlorate?

Confirmed perchlorate releases have occurred in at least 20 states throughout the United States (see Figure 2). In EPA Region 9, perchlorate releases have occurred in California, Arizona, and Nevada. Perchlorate has also been released into the Colorado River, which is a drinking water source for some areas of the region. Additional information and maps detailing those sites are available in Chapter 1 of the draft of the "Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization." EPA, other federal agencies, states, water suppliers and industry are already actively addressing perchlorate contamination through monitoring for perchlorate in drinking water and surface water. The full extent of perchlorate contamination is not known at this time.

What is Being Done about Perchlorate?

A peer review of the draft perchlorate

toxicity assessment will be held March 5 and 6, 2002 in Sacramento, CA. The purpose of the peer review is to provide an independent review of the scientific information and interpretation used in the document. Once the assessment is finalized, the reference dose will be used in EPA's ongoing efforts to address perchlorate problems. EPA's draft reference dose represents a preliminary estimate of a protective health level and is not a drinking water standard. In the future, EPA may issue a Health Advisory that will provide information on protective levels for drinking water. This is one step in the process of developing a broader response to perchlorate including, for example, technical guidance, possible regulations and additional health information. A federal drinking water regulation for perchlorate, if ultimately developed, could take several years.

In 1998, perchlorate was placed on EPA's Contaminant Candidate List for consideration for possible regulation. In 1999, EPA required drinking water monitoring for perchlorate under the Unregulated Contaminant Monitoring Rule (UCMR). Under the UCMR, all large public water systems and a representative sample of small public water systems are required to monitor for perchlorate over the next two years to determine whether the public is exposed to perchlorate in drinking water nationwide.

How is Perchlorate Removed from Water?

Several types of treatment systems designed to reduce perchlorate concentrations are operating around the United States, reducing perchlorate to below the 4 ppb reporting level. Biological treatment and ion (anion) exchange systems are among the technologies that are being used, with additional treatment technologies under development.

Many other perchlorate studies have been completed during the last several years. A May 2001 summary of 65 perchlorate treatment studies is available online at www.gwrtac.org/ (click on "Technical Documents" then look for "Technology Status Reports"). The summary report was prepared by the Ground-Water Remediation Technologies Analysis Center. Most of the projects described in the report are bench-scale and pilot-scale demonstrations of water treatment technologies, although several entries describe full-scale systems and soil treatment methods. Most of the projects employ biological treatment methods or ion (anion) exchange technology, although reverse osmosis, nanofiltration, granular activated carbon, and chemical reduction are also discussed. Results of federally-funded perchlorate treatment research, managed by the American Water Works Association Research Foundation (AWWARF), are also becoming available (see www.awwarf.com/research/spperch.asp).

Is Perchlorate-contaminated Water Safe to Drink?

EPA's draft toxicity assessment is preliminary and thus, it is difficult to make definitive recommendations at this stage. Other factors that influence the answer to this question include how much water is consumed, the degree of perchlorate contamination and the health status of the consumer.

Sensitive populations, like pregnant women, children and people who have health problems or compromised thyroid conditions, should follow the advice of their health care provider regarding the amount and type of liquids, including water that should be consumed.



Figure 1: U.S. Perchlorate Manufacturers and Users, as of October 2001

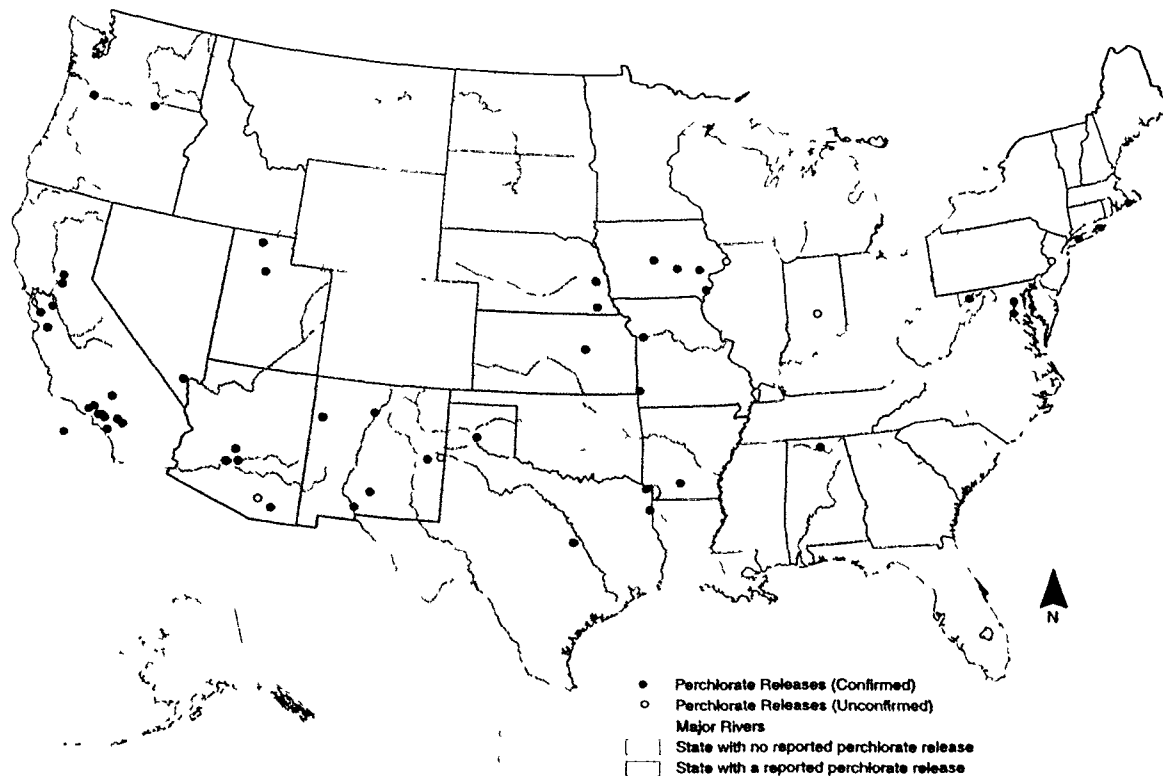


Figure 2: Reported Releases of Perchlorate into the Environment, as of November 2001

For more information

U.S. Environmental Protection Agency Contacts

Direct health and risk assessment questions to:

Annie Jarabek

National Center for Environmental Assessment
Office of Research and Development
(919) 541-4847

Direct questions about occurrence to:

Kevin Mayer

Region 9 Remedial Project Manager
Superfund Division
(415) 972-3176

Direct questions about treatment technology to:

Wayne Praskins

Region 9 Superfund Division
San Gabriel Valley treatment studies
(415) 972-3181

Direct questions about regulatory issues to:

David Huber

Office of Ground Water and Drinking Water
(202) 564-4878

Direct questions about the Integrated Risk Information
System (IRIS) to:

Amy Mills

National Center for Environmental Assessment
Office of Research and Development
(202) 564-3204

During the peer review and in regard to Region 9

Direct press inquiries to:

Lisa Fasano

Region 9 Office of Public Affairs
(415) 947-4307

After peer review and outside of Region 9

Direct press inquiries to:

Dave Deegan

EPA Office of Media Relations
(202) 564-7839

or

Richard David

Immediate Office of the Assistant Administrator
Office of Research and Development
(202) 564-3376

Direct questions about community involvement or the
mailing list to:

Wenona Wilson

Region 9 Community Involvement Coordinator
Superfund Division
(415) 972-3239
(800) 231-3075



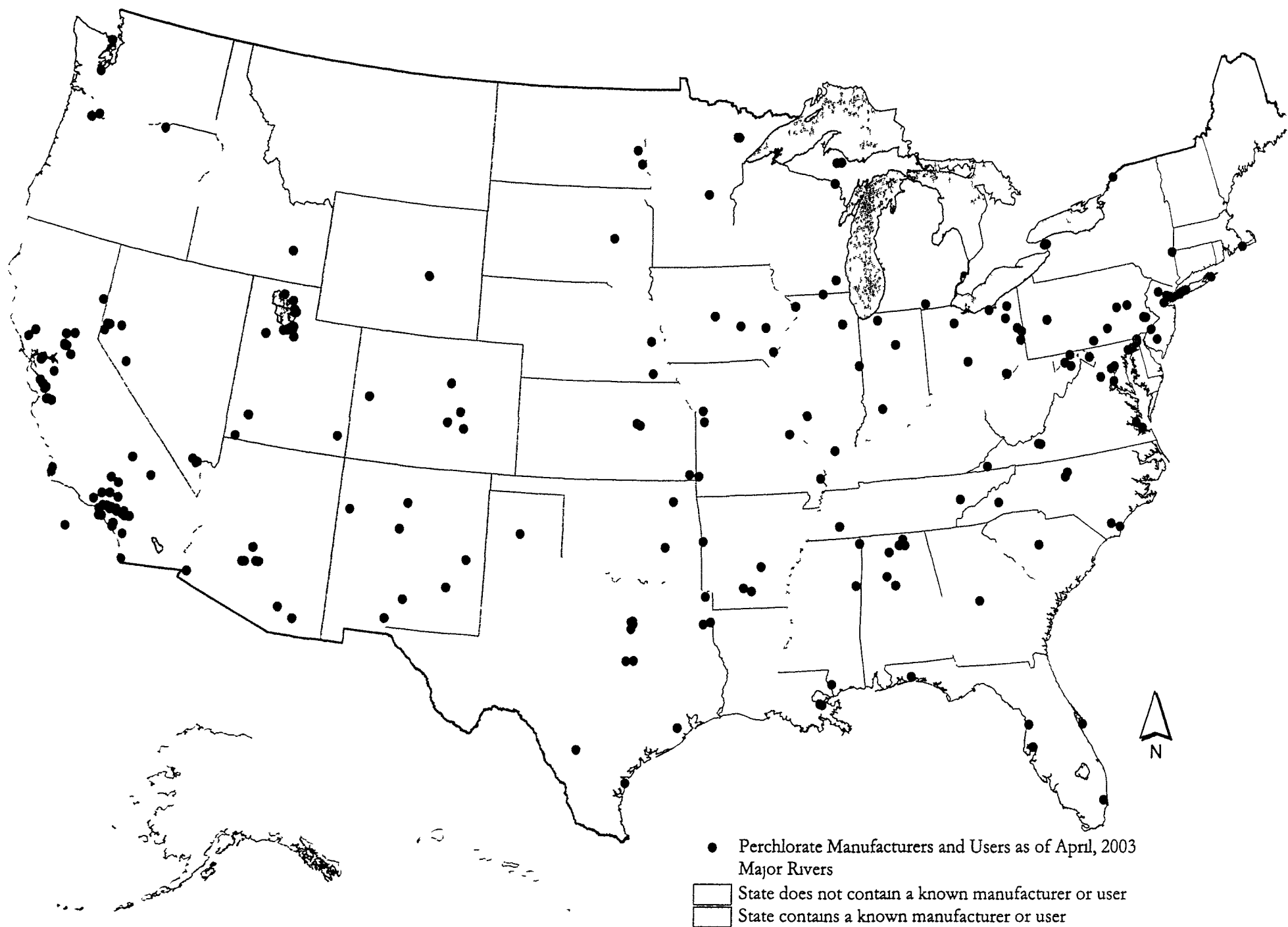
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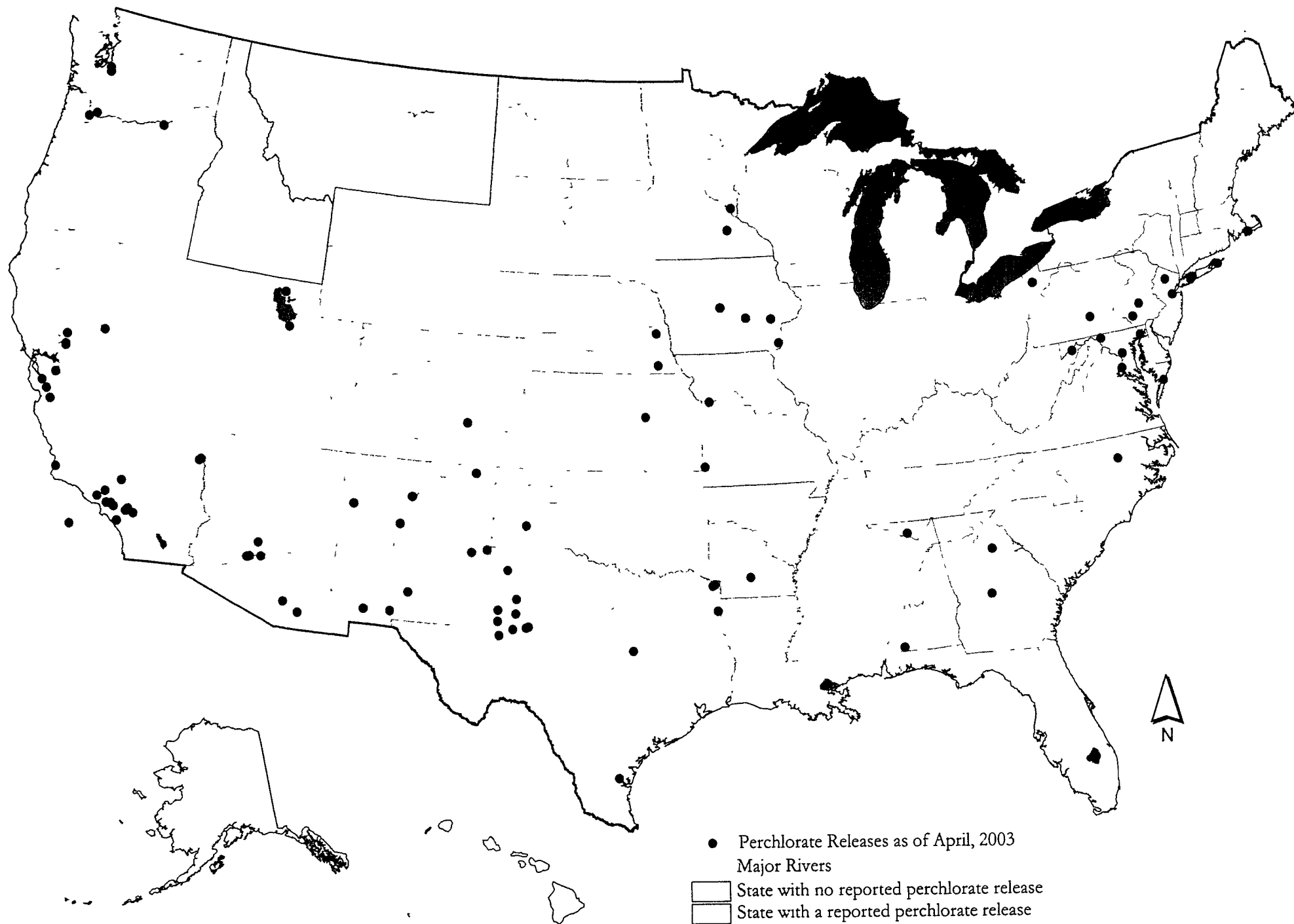
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street (SFD-3)
San Francisco, CA 94105
Attn: Wenona Wilson

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Penalty for Private Use, \$300

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Robert A. Howd, Ph.D.

Bob Howd is the chief of the water toxicology evaluation program in the Office of Environmental Health Hazard Assessment of Cal/EPA. This group provides risk assessments for chemicals in drinking water, which are called California Public Health Goals (see www.oehha.ca.gov/water). Dr. Howd has an undergraduate degree in Chemistry, a Ph.D. in Pharmacology from the University of Washington, and had postdoctoral training in the Department of Nutrition and Food Science at MIT. In addition to risk assessment, his interests are in neurotoxicology, with emphasis on pesticides and solvents, and exposure issues. Dr. Howd has worked for the State of California for over 15 years, the first 2 as a toxicologist with the Department of Toxic Substances Control on hazardous waste cleanups, and for the past 13 years with OEHHA. He was involved in biomedical and toxicological research at SRI International for the previous 12 years. He is an active member of the Federal/State Toxicology and Risk Assessment Committee (FSTRAC) and the Northern California chapters of the Society of Toxicology (current president) and the Society for Risk Analysis (past secretary and treasurer). Dr. Howd has authored or coauthored over 50 formal scientific publications, and numerous government reports.

Risk Assessment of Perchlorate for Development of the Public Health Goal

Robert A. Howd, Ph.D.
Chief, Water Toxicology Unit

Office of Environmental Health Hazard Assessment
California Environmental Protection Agency
Oakland and Sacramento, California

8/12/2003

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Topics to be covered:

- The California process for regulating chemicals in drinking water – PHGs, MCLs, ALs
- Perchlorate risk assessment
- Perchlorate scientific issues
- Status of perchlorate standards

8/12/2003

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California Water Standards

Defined by DHS and OEHHA, regulated
under the California Safe Drinking Water Act

- PHG – Public Health Goal, estimated safe level, including *de minimis* cancer risk level (OEHHA)
- MCL – Maximum Contaminant Level, maximum level allowed, considering technical and economic feasibility (DHS)
- Action Level – “Advisory” level for otherwise non-regulated chemicals (DHS and OEHHA)

8/12/2003

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U.S. EPA

California

RfD/MCLG = PHG

MCL = MCL

MCLs must be set as close as feasible to the health goals under both statutes; California MCL must be equal to or lower than federal MCL

8/12/2003

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Perchlorate Risk Assessment

- PHG requested by DHS, and underway in OEHHA for about four years
- Extensive literature review and analysis
- Lengthy internal and external scientific and public review process

8/12/2003

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Thyroid gland

- Supports metabolism and cell growth
- Thyroid takes up iodine and forms thyroid hormones T3/T4, which are released after stimulation by TSH
- Deficiency causes goiter and growth retardation
- Overactivity causes Graves Disease

8/12/2003

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Perchlorate Effects

- Inhibition of iodine uptake into thyroid
- Decreased thyroid function, decreased growth and cell metabolism
- Potentially cause goiter in pregnant women and developmental effects including decreased IQ in offspring
- Thyroid tumors in rodents and aplastic anemia in humans (high doses)

8/12/2003

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Critical endpoint chosen by OEHHA

- Inhibition of thyroid uptake of iodide
 - The first event in the chain of anti-thyroid effects of perchlorate
 - Reversible inhibition of sodium iodide symporter (NIS)
 - Treated as an undesirable effect, which is appropriate to prevent

8/12/2003

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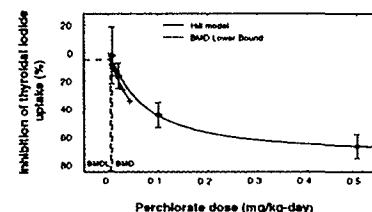
Design of the Critical Study Greer *et al.* (2002)

- Four groups of male and female volunteers dosed at 0.007, 0.02, 0.1, or 0.5 mg/kg-day via drinking water
- Exposure period: 14 days
- Radioactive iodide uptake by the thyroid measured before and at end of exposure period

8/12/2003

9

Benchmark dose modeling of Greer *et al.* data



8/12/2003

10

Evaluation of Iodide Uptake Inhibition in the Greer *et al.* (2002) Study

- Point of departure: 5% decrease of the mean radioactive iodide uptake
- BMD, estimated dose associated with this point, is 0.0068 mg/kg-day
- BMDL, the lower 95% confidence limit of this point, is 0.0037 mg/kg-day
- NOAEL = 0.007 mg/kg-day

8/12/2003

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Critical endpoints chosen by U.S. EPA

- Multiple low-dose effects in rat studies
 - Changes in rat brain development
 - Behavioral changes
 - Immunological effects

8/12/2003

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Why not choose changes in serum T4 as the endpoint?

- Variable threshold for T4 depression, affected by many factors:
 - Dietary iodide intake level
 - Exposure duration
 - Amount of iodide stored in thyroid
 - Variability in thyroid hormone regulation
 - Environmental and behavioral influences

8/12/2001

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Why not choose changes in serum T4 as the endpoint?

- It does not consider effects of NIS inhibition in other extra-thyroidal tissues (e.g., mammary glands)
 - Breast milk is the sole source of iodine for some infants
 - Iodine required for normal growth
 - Perchlorate also excreted in breast milk

8/12/2001

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Perchlorate Scientific Issues

- Use of human versus animal data, with corresponding UFs (30 or 300)
- Identification of iodine uptake inhibition as the critical effect
- Evidence for/against sensitive populations
- Adequacy of UF, considering data limitations

8/12/2001

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Exposure Calculations

- Drinking water considered primary exposure route
- Uptake into plants from irrigation water an important consideration
- Perchlorate contribution from food not yet calculable
- "Relative source contribution" not clear

8/12/2001

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At environmental concentrations, could perchlorate cause?

- Goiter in pregnant women
- Adverse neurological development in fetuses and infants
- Reduction of IQ in offspring
- Additional stress on patients suffering from hypothyroidism

8/12/2001

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Status of Perchlorate Standards - Federal

- U.S. EPA proposed an RfD of 0.00003 mg/kg-day in 2002, with a DWEL of 1 ppb
- RfD document under review by NAS, report will take several months
- MCL will take 2-3 years after RfD finalized

8/12/2001

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Status of Perchlorate Standards - California

- DHS set Action Level of 4 ppb in 2002
- OEHHA proposed PHG in the range of 2-6 ppb in 2002
- SB1822 (HSC 116293) required OEHHA to adopt a PHG on Jan 1, 2003, and DHS to adopt an MCL on or before Jan 1, 2004

8/12/2003

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Status of Perchlorate Standards - California

- Industry sued to require 2nd peer review of PHG, and won
- Draft PHG now submitted for 2nd UC peer review
- PHG delayed for at least a year
- MCL finalization date unknown

8/12/2003

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Meanwhile....

- Crop analyses continuing
- More perchlorate-contaminated wells being discovered
- Current bills in the U.S. Senate (Boxer) and Assembly (Capps) direct U.S. EPA to finalize an MCL in 2004.

8/12/2003

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OEHHA contacts:

Allan Hirsch, Deputy Director, External and Legislative Affairs	(916) 324-0955
George Alexeeff, Ph.D., Deputy Director for Scientific Affairs	(510) 622-3202 or (916) 322-2067
Robert Howd, Ph.D., Chief, Water Toxicology Unit	(510) 622-3168 bhowd@oehha.ca.gov

Useful websites:

OEHHA: www.oehha.ca.gov
DHS: www.dhs.ca.gov/ps/ddwem/chemicals/chemindex.htm
U.S. EPA: www.epa.gov/safewater/mcl.html

8/12/2003

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Proposed Public Health Goal for Perchlorate

A fact sheet by Cal/EPA's
Office of Environmental Health Hazard Assessment

The Office of Environmental Health Hazard Assessment (OEHHHA) has prepared this fact sheet to provide general information about its proposed Public Health Goal (PHG) within the range of 2 to 6 parts per billion (ppb) for perchlorate, a drinking water contaminant.

What Is Perchlorate? Perchlorate is a chemical used to facilitate combustion of rocket and missile fuel, explosives, fireworks, and road flares. It may also be used in air-bag inflation systems, lubricating oils, and the manufacture of paints and many industrial goods. In the past, physicians used perchlorate to treat Graves' Disease, a disorder that causes an overproduction of thyroid hormones.

Perchlorate in Ground and Drinking Water. Outdated disposal practices in the decades prior to modern environmental laws allowed perchlorate to contaminate groundwater, particularly near weapons and rocket fuel manufacturing facilities and disposal sites, research facilities, and military bases.

Perchlorate can persist for many years in ground and surface water and is difficult to remove with standard water treatment processes. The Department of Health Services (DHS) in 2000 reported detections (down to the lowest measurable level) of perchlorate in 44 public drinking water systems, with 23 systems indicating levels greater than 18 ppb. Contamination is even more extensive in some locations. Perchlorate levels of up to 260 ppb were also detected in wells near weapons manufacturing facilities in Sacramento and Los Angeles counties, and levels of up to 150 ppb were measured near other locations, including the site of a former munitions plant in Santa Clarita and a research facility in Pasadena. Perchlorate has also been found in a number of drinking water and monitoring wells in Riverside and San Bernardino counties.

Perchlorate is used in air bag inflation systems, lubricating oils, and the manufacture of paints and industrial goods. It is also used in rocket and missile fuel.

Health Effects of Perchlorate. One of the more serious human health effects observed in scientific studies is perchlorate's disruption of thyroid hormone production. The thyroid produces two principal hormones, triiodothyronine (T3) and thyroxine (T4), which help to regulate the body's metabolism and physical growth. To produce these hormones, the thyroid needs iodine, which the body absorbs from iodized salt, seafood, and other foods. Perchlorate, however, blocks the transport of iodine to the thyroid gland. If the blockage persists and the thyroid's iodide reserves are significantly reduced, the thyroid may decrease its production of T3 and T4. The pituitary gland and the hypothalamus, which regulate thyroid hormones, in turn elevate their own hormone production to compensate for the lowered levels of T3 and T4. Because T3 and T4 hormones are essential to the body's production of energy and rate of metabolism, as well as to mental performance, any notable imbalance can

significantly impair all of these functions. Inhibited thyroid function can result in hypothyroidism and, in rare cases, thyroid tumors.

Pregnant women and their developing fetuses may suffer the most serious health effects from perchlorate contamination in drinking water, particularly in the first and second trimesters of pregnancy. During this period, the fetal thyroid is not yet fully functional, so the mother's thyroid must be able to produce enough extra T4 hormone to enable her baby's brain to develop properly.

Because pregnancy already places a strain on the maternal endocrine system, pregnant mothers and their fetuses are particularly susceptible to perchlorate's inhibition of iodine intake. Women with critically low levels of iodine can miscarry, or their developing fetuses can suffer congenital hypothyroidism, which may stunt the fetus's physical growth and impede proper development of its central nervous system. Even moderate to mild iodine deficiency during pregnancy has been linked to impaired brain development and lower IQs for children born under these conditions.

Establishing the Proposed PHG for Perchlorate. Under the California Safe Drinking Water Act, OEHHA is required to develop PHGs for chemical contaminants in California's publicly supplied drinking water. A PHG is the level of a chemical contaminant in drinking water that, based upon currently available data, does not pose a significant risk to health. It represents an optimal level that the state's drinking water providers should strive to achieve if it is possible to do so. State law requires DHS to set regulatory drinking water standards as close to the corresponding PHGs as is economically and technically feasible.

In developing the proposed PHG for perchlorate, OEHHA conducted a thorough analysis of all available scientific studies on perchlorate's health effects. OEHHA proposed a PHG within the range of 2 to 6 ppb for perchlorate because it determined that levels within this range would not pose a hazard to pregnant woman and their developing fetuses, the groups with the greatest sensitivity to perchlorate. This amount of perchlorate in drinking water also would not be expected to increase the risk of thyroid tumors.

OEHHA proposed a PHG within the range of 2 to 6 ppb to protect the health of pregnant woman and their developing fetuses, the groups with the greatest sensitivity to perchlorate.

In December 2002, OEHHA posted a revised PHG document on its Web site and announced a 45-day public-comment period. OEHHA will consider the comments it receives when setting the final PHG. The proposed PHG document is available for downloading from OEHHA's Web site at <http://www.oehha.ca.gov/>. Further information on PHGs is also available on OEHHA's Web site or can be obtained by contacting OEHHA at (916) 324-7572, or by mail at P.O. Box 4010, Sacramento, CA, 95812-4010.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see California's official "Flex Your Power" Web site at www.flexyourpower.ca.gov.

Harvey Packard

Mr. Packard received a master's degree in civil and environmental engineering in 1992 from Cal Poly San Luis Obispo. He has worked for the Central Coast Regional Water Quality Control Board for 11 years, all in the area of hazardous materials cleanups. He is currently a senior engineer, leading group of 5 other engineers and geologists. Mr. Packard is a licensed civil engineer.

**Regional Board Response to San Martin
Area Perchlorate Contamination**

Harvey Packard
California Regional Water Quality Control Board
Central Coast Region

Regional Board Authority

- **Water Code Section 13267**
 - *The regional board may require any person who has discharged, discharges, or is suspected of having discharged waste to submit technical or monitoring program reports.*

Regional Board Authority

- **Water Code Section 13304**
 - *Any person who has discharged waste or caused or permitted waste to be discharged where it creates or threatens to create a condition of pollution or nuisance, shall upon order of the regional board, clean up the waste or abate the effects of the waste.*

Regional Board Regulations

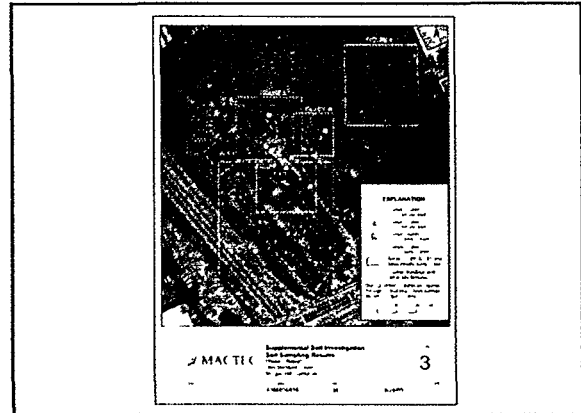
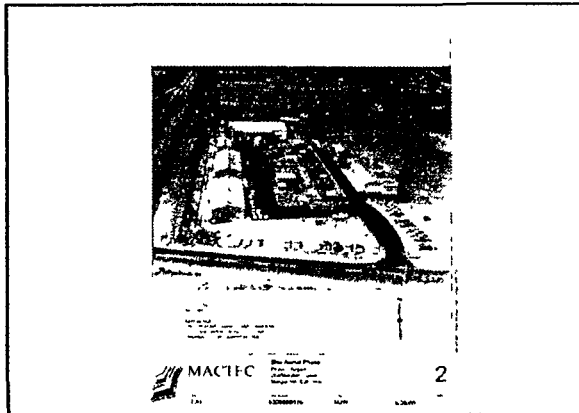
- **Cleanup Policy (SWRCB Resolution No. 92-49)**

Response to Olin Case

- **Find and Replace Contaminated Wells**
- **Assess Contamination on Olin Property**
- **Get Cleanup Going**

Site Assessment

- **Hundreds of soil borings**
- **Many groundwater samples**



Cleanup Alternatives

- **Olin's Responsibility to Propose Cleanup**
- **Regional Board Reviews, Approves**
 - "The Regional Water Board shall concur with any investigative and cleanup and abatement proposal which the discharger demonstrates and the Regional Water Board finds to have a substantial likelihood to achieve compliance, within a reasonable time frame, with cleanup goals and objectives." (Res. No. 92-49, III.A.)

Possible Cleanup Methods

- **Soil**
 - Excavation and Off-Site Disposal
 - Excavation and On-Site Treatment
 - In-Situ Treatment

Possible Cleanup Methods

- **Groundwater Near the Site**
 - Extraction and Treatment

Cleanup/Replacement Alternatives

- **Basin-Wide Groundwater**
 - Point of Use
 - Well-Head Treatment
 - Individual Wells
 - Community Wells
 - New Sources
 - Wells
 - Surface Water